

What is claimed is:

1. A method of removing polymer generated in a semiconductor manufacturing process, which includes sequentially depositing a lower metal layer, an insulating layer and an upper layer on a semiconductor substrate; forming a photoresist pattern on the upper metal layer; and etching the upper metal layer and the insulating layer by using the photoresist pattern as a mask, the polymer being generated during the etching step, the method comprising:

- (a) removing the photoresist pattern by using O_2 / N_2 plasma; and
- (b) removing the polymer existing on the lower metal layer by using H_2O / CF_4 plasma.

2. A method as defined by claim 1, wherein (a) is carried out for about 50 seconds.

3. A method as defined by claim 1, wherein a flow rate of a CF_4 gas in (b) is in a range from 5 % to 15 % of that of a H_2O gas.

4. A method as defined by claim 1, further comprising (c) by using O_2 plasma, removing residues of the photoresist pattern remaining after (b).

5. A method as defined by claim 4, wherein powers used in the (a), (b) and (c) are substantially same.

6. A method as defined by claim 4, wherein a process time of (c) is in a range from 40 % to 60 % of that of (a).

7. A method as defined by claim 4, wherein a process time of (b) is in a range from 30 % to 50 % of that of (a).

8. A method of manufacturing a semiconductor device having a capacitor, the method comprising:

- (a) sequentially depositing a lower metal layer, an insulating layer and an upper metal layer on a semiconductor substrate;
- (b) forming a first photoresist pattern on the upper metal layer;
- (c) forming an upper electrode film and a capacitor insulating film by etching the upper metal layer and the insulating layer by using the first photoresist pattern as a mask;
- (d) removing the first photoresist pattern by using O₂ / N₂ plasma;
- (e) removing polymer existing on the lower metal layer by using H₂O / CF₄ plasma;
- (f) forming a second photoresist pattern for completely encapsulating the upper electrode film and the capacitor insulating film;
- (g) forming a lower electrode film by etching the lower metal layer by using the second photoresist pattern as a mask; and
- (h) removing the second photoresist pattern to provide the capacitor including the lower electrode film, the capacitor insulating film and the upper electrode film.

9. A method as defined by claim 8, further comprising, between (e) and (f): removing residues of the first photoresist pattern remaining after (e) by using O₂ plasma.